



Los Alamos National Laboratory
Space Science and Technology Division

A National Resource in Space Science Technology from Concept to Product

HiLites

Quarterly Highlights of the Space Science and Technology Division

NUMBER 2, 1993

SUMMER 1993

News Flash

In an announcement July 16, Director Sig Hecker outlined a restructuring of Laboratory management. Hecker said the new structure is designed to give Los Alamos National Laboratory a competitive advantage in a changing world where military competition has given way to economic competition and where the Laboratory has many customers instead of one patron. When the restructuring process is complete in about 6 months, 67 of the present senior management members will be replaced by 27 division directors and program directors. Hecker commented that the flatter management structure will provide a better alignment of the organization and the work that must be done. Spreading responsibility among fewer managers will mean less supervision, greater individual participation, and more empowerment. Laboratory focuses will be program development, program execution, and customer satisfaction.

Under the new structure, the Laboratory's capabilities fall into three categories: technical capabilities, with fourteen divisions; program capabilities, with nine offices; and support and services capabilities, with four divisions. SST Division will be combined with the current International Technology Division and elements of the current Nuclear Technology Division to form a new technical division named International Technology and Sensors. The new division will represent the Laboratory's core capabilities in international technology assessment, sensors, and instrumentation technology necessary to develop new and improved systems to counter the proliferation of weapons of mass destruction. The International Technology and Sensors Division will be closely allied with a Nonproliferation and Intelligence program office, with overall responsibility for nonproliferation, arms control, intelligence, and nuclear safeguards programs at Los Alamos. Director Hecker announced that Don Cobb, the current SST Division leader, will be director of both the International Technology and Sensors Division and the Office of Nonproliferation and Intelligence, thereby consolidating the capabilities of the Laboratory in this important area of national security.

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Earth's orbit is being more than offset by a drift in declination, which is slowly degrading ALEXIS's power state.

The ALEXIS team is therefore performing a series of attitude control maneuvers to reorient the satellite so its solar panels face the sun more directly. A functioning magnetometer would measure the satellite's position relative to the Earth's magnetic field; without the aid of the instrument, however, determining the satellite's orientation was a challenge. The team modeled the Earth's magnetic field and used the satellite's twelve sun sensors and horizon crossing sensor to determine the sun's location relative to ALEXIS. The maneuver uses the satellite's electromagnetic torque coils to push against the Earth's magnetic field and change the satellite's orientation. During the maneuvers, an onboard torque coil is selectively activated to gently reorient the entire spacecraft as if it were a big compass needle. Preliminary evidence indicates that the first maneuver was successful; the average sunlight level began to increase. If the series of maneuvers is successful, and can be done with enough precision, the ALEXIS team hopes to be able to use the second scientific experiment aboard ALEXIS, six x-ray telescopes, as intended for studying x-ray emissions from space. The data from the x-ray telescopes will be difficult to analyze if the satellite's orientation is not well known.

Data show that the satellite's spin may be slowing, but an operation to speed up the spin will probably not be necessary for several months. (Contacts: Bill Friedhorsky, 505-667-5204; Jeff Bloch, 505-665-2568)

Demonstration Flight Funded for Atmospheric Radiation Measurements Program

The Atmospheric Radiation Measurements (ARM) Program is a major Department of Energy research initiative to improve our understanding of radiative and cloud processes critical to predicting the Earth's climate and its

changes. Central to the effort is the use of several intensively instrumented sites for long-term (decadal) study and characterization of atmospheric processes. The first site is now coming into operation near Lamont, Oklahoma; the second site will be in the tropical western Pacific (coordinated by Bill Clements of the Geoanalysis group [EES-5]); and the third will be on the North Slope of Alaska.

To supplement the extensive suite of ground-based instruments, several researchers have noted the desirability (if not the necessity!) of measuring boundary conditions at the "top" of the atmosphere. SST Division has participated in several proposals for satellite, aircraft, and unmanned aerospace vehicle (UAV) measurements. Recently, a consortium led by Sandia National Laboratories, California (SNL/CA), and of which we are a member, was funded to perform a UAV demonstration flight (UDF).

The UDF will use existing instruments on a rented UAV to prove the viability of the concept. The instruments will be

- up- and down-looking, hemispherical view, broadband radiometers from the National Aeronautics and Space Administration to establish radiative fluxes at several heights,
- a direct/diffuse radiometer to establish atmospheric conditions,
- a narrow-band radiometer from the University of Colorado to infer atmospheric composition and spectral distributions, and
- a "standard" meteorological package.

The UDF is expected to take place over the ARM site in Oklahoma at the end of this year, and data from the ground site will be merged with the UDF measurements.

The scientific goal of the UDF is to obtain flux divergence measurements, that is, the net radiation absorbed or emitted from a layer of the atmosphere. To meet this goal, we will need to take very accurate measurements of the net

flux (up minus down) at two or more heights and then subtract these net fluxes. Because the unidirectional fluxes are large, and flux divergence is small, accuracy of measurements is of the essence. Our role in the UDF is to use our optical calibrations capabilities to ensure that calibrations are appropriate and well understood and to model the impact of uncertainties on the measurements. We are collaborating with the National Institute for Standards and Technology, the National Energy Research Laboratories, NASA Ames, the University of Colorado, Sandia (Albuquerque and California), Pacific Northwest Laboratories, and others. Major contributors at Los Alamos are Steve Bender and Redus Holland of the Chemistry and Laser Sciences Division and Bill Maier of SST Division's Astrophysics and Radiation Measurements group (SST-9). (Contact: Paul Weber, 505-667-5776)

Field Neutron Spectrometer

Penetrating neutron and gamma-ray radiation provides the most common signature for locating and characterizing nuclear weapons or weapons material. Unfortunately, gamma-ray techniques are often discouraged in cooperative site inspections; besides locating and characterizing nuclear weapons or materials, these techniques often reveal intrusive details about materials and structures. Furthermore, relying only on conventional neutron detectors often provides little more than a simple measurement of neutron flux. In principle, fast-neutron scintillation detectors can further characterize the neutron source, but they require specialized electronics and spectral analysis that are impractical for field applications.

Boron-loaded scintillator technology provides a promising option for an improved neutron detector. Our goal for the 4-year Field Neutron Spectrometer (FNS) project is to develop and demonstrate this approach in a portable survey instrument. The operating principle involves sequential detection of (1) neu-